

Team: Arstrium Systems

Challenge: Let it Go!

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1) Universal Screw Release System (USRS).

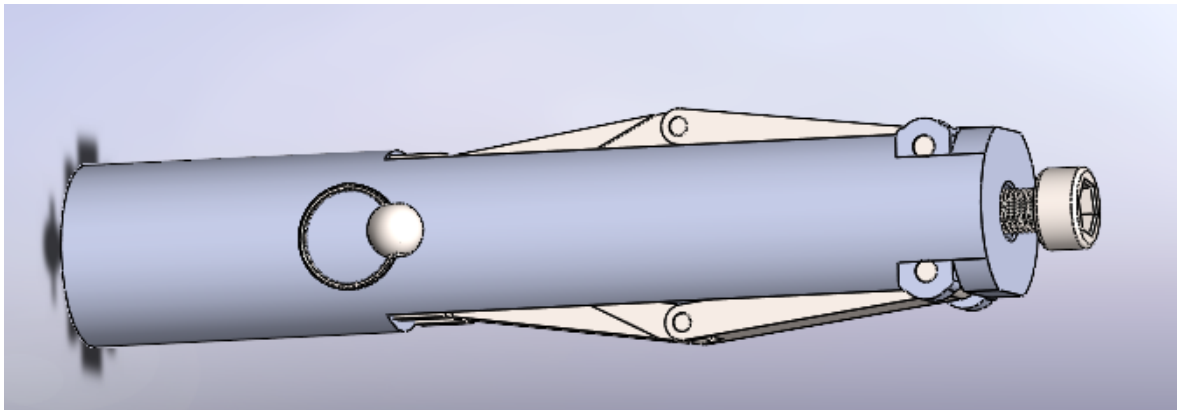
It is a simple system in which two blades press the nut in which the screw is threaded. When removing the mechanical lock, the spring pushes the piston and rotates the blades through 90° degrees, forcing the nut to separate and release the screw.

The device measures 20 x 105mm and supports a 5mm screw. The design can be adjusted to both larger and smaller screws.

In the computer simulation it showed a resistance greater than 1 ton, with a mass of 80 grams in titanium alloy. Compared to its weight and dimensions, it offers great performance due to the tensile forces it can withstand.

With some small design changes, it is easy to adapt with a motor or actuator so that the actuation is electric.

The design was made in SolidWorks and ANSYS was used for the computer simulation.



Screw: 5mm Ø

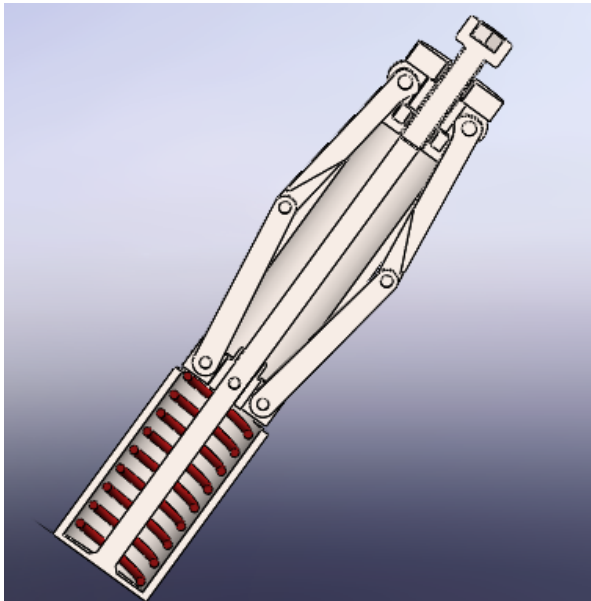
Titanium alloy body.

Mass: 80 grams.

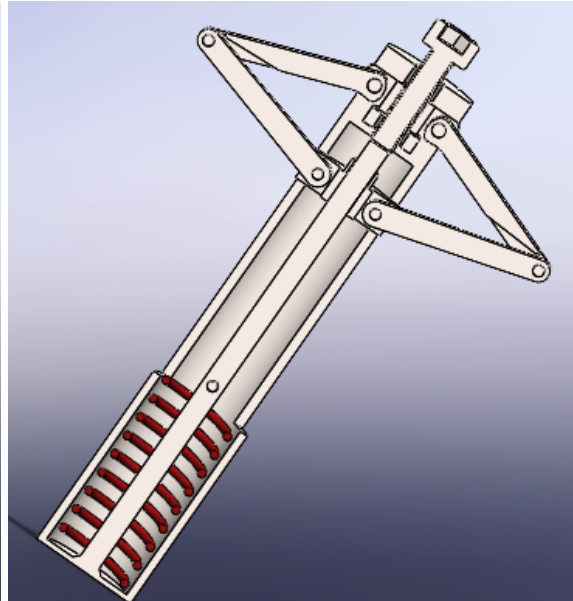
Measurements: 20 x 105 mm.

Working temperature: -10°C to 60°C.

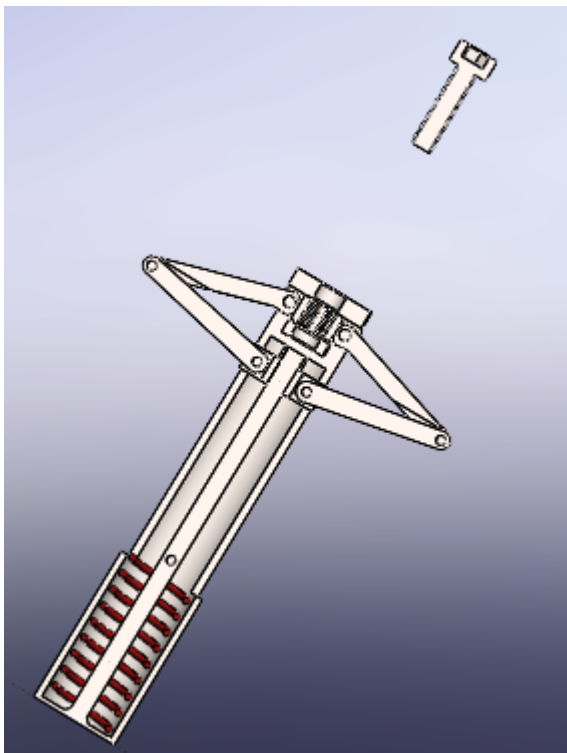
Behaviour:



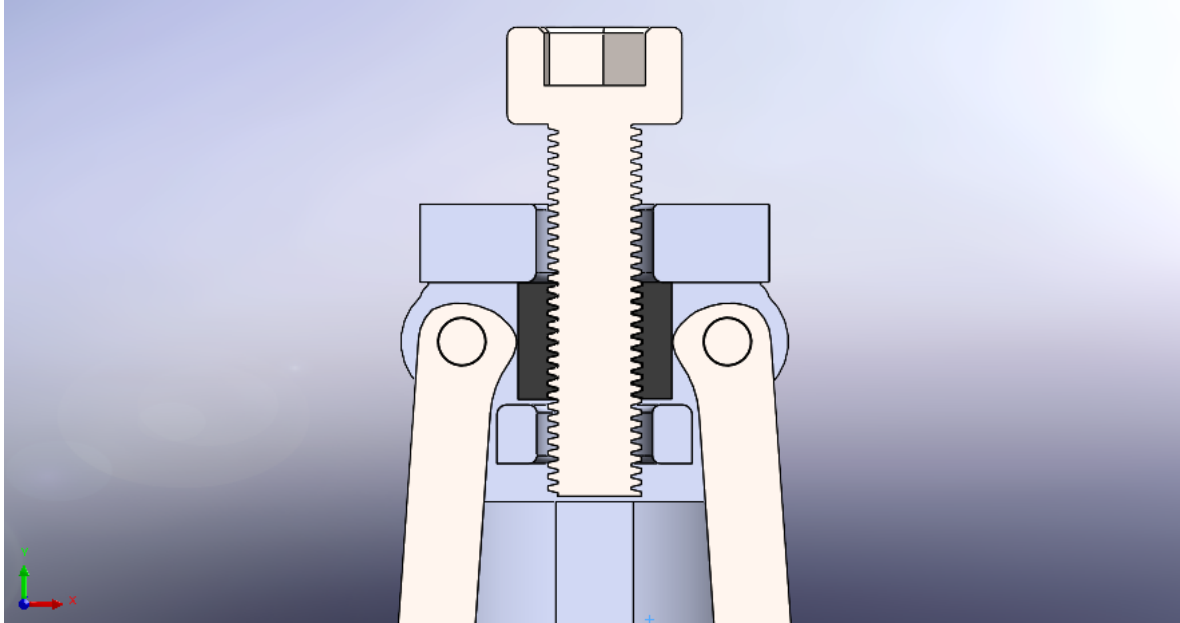
1. System ready to operate.



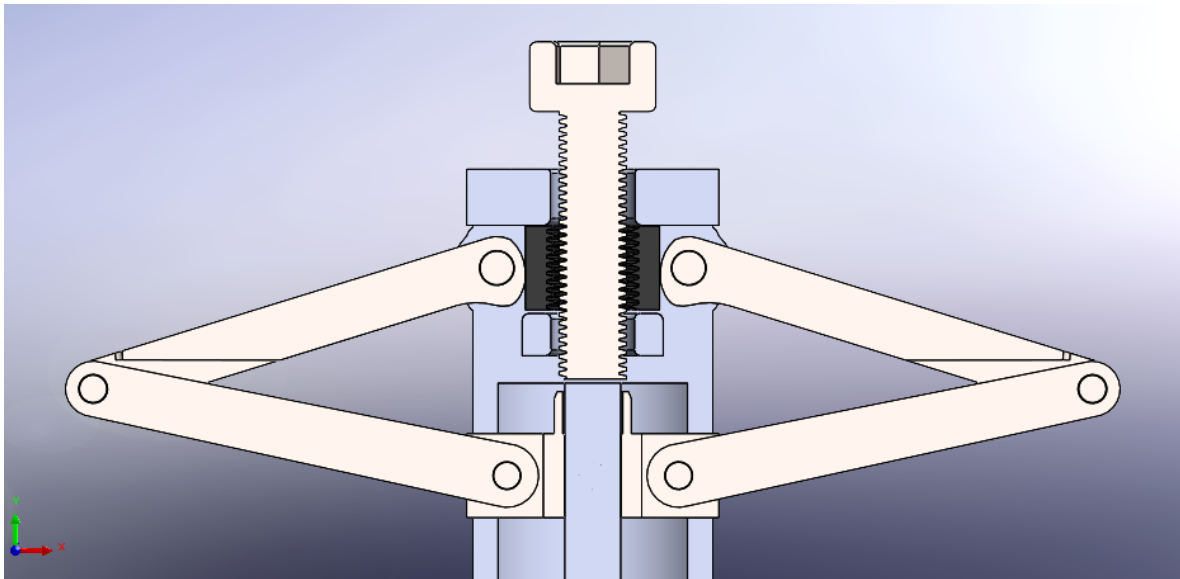
2. Opening of teeth after releasing the lock.



3. Release the screw.

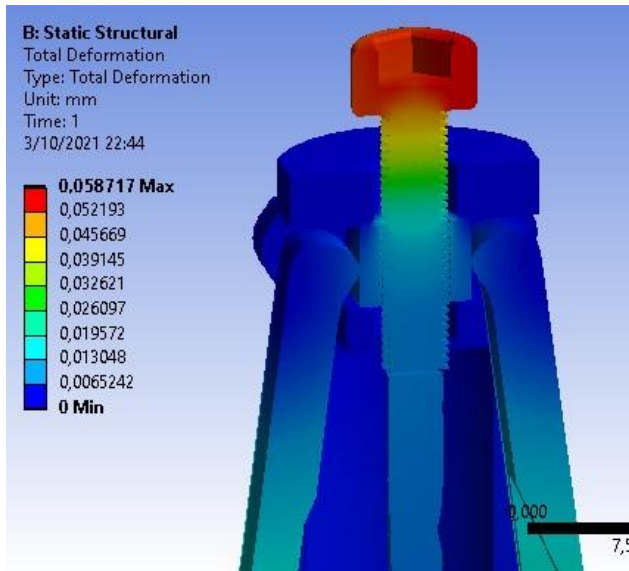


4. Closed system. The screw is secure in the device.

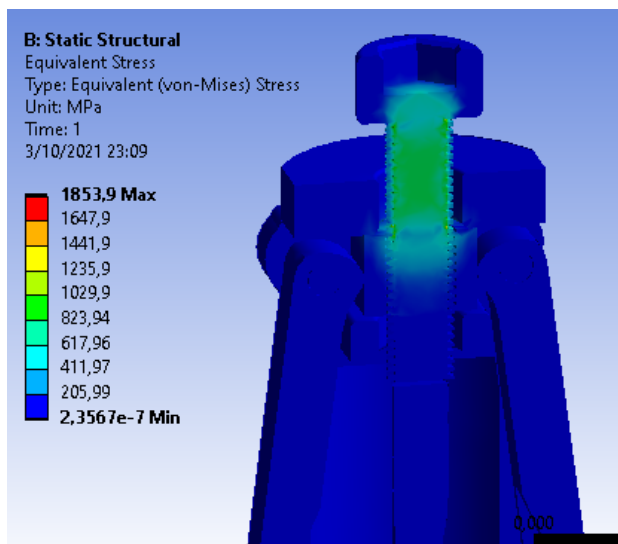


5. Open system. The opening of the nut allows the release of the screw.

Structural analysis:

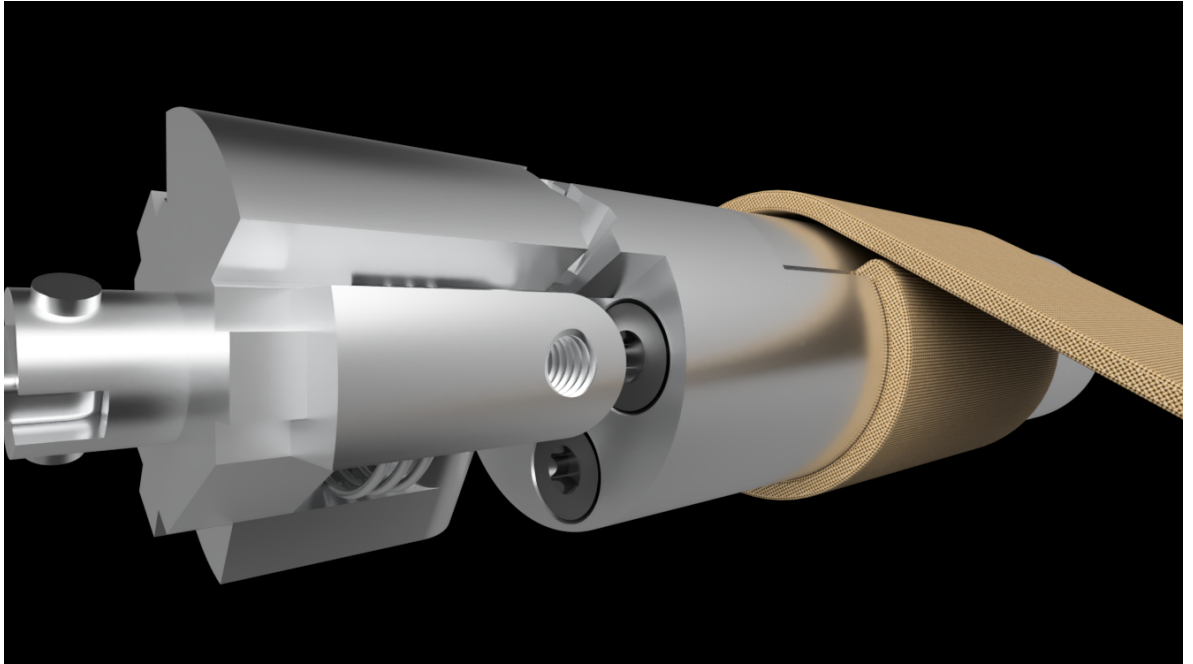


A maximum deformation is observed in the steel screw for a displacement of 0.058 mm.



1 ton stress analysis. The device shows no critical stress. The results are optimal.

2) System 2: Rotating Clamp Release System (RCRS).



It is an innovative system of restriction and controlled release of ropes and straps, this system is similar to a traditional clamp but uses the following innovative concepts:

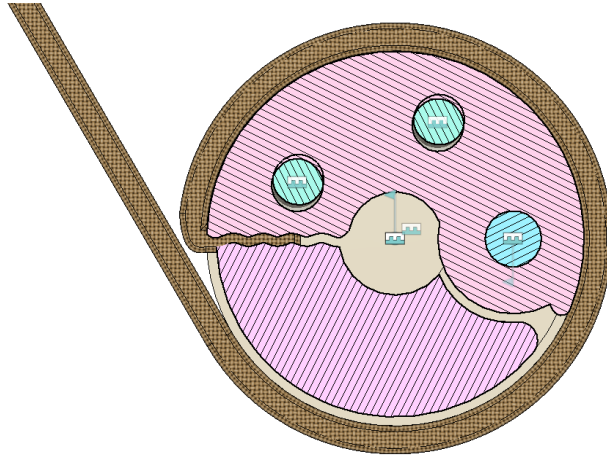
automatic opening by centripetal forces: the free rotation of the device causes automatic opening by centripetal forces

Rotating system to increase the restriction: The restriction of the system increases when the tension generated by the rope is greater, this is due to the geometry of the device, the direction of the stresses, and the position of the axis of rotation of the gripper.

the combination of both concepts lead to the following behavior of the mechanism. Unlocking the system, the tension of the rope will rotate the device and at the same time open the clamp by centripetal force.

Ropes or straps constraint operation

- 1) Insert the rope in the clamping area, the rope must go around the device, the higher the tension, the greater the tightening force.



- 2) Thumbscrew rotates to lock roller and caliper position.

Rope release:

- 1) Rotate the thumbscrew to unlock the roll twist and the hand gripper, a spring releases the locking mechanism. the roller will begin to rotate due to the tension of the rope, in turn the centripetal force will open the clamp widely to release the rope.

SPECS:

Titanium alloy body.

Mass: 136gr.

Measurements: 20mm x 141 mm.

Working temperature: -10°C to 60°C.

The system works with straps up to 40mm wide.

3. REFERENCES

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